

### **REMARKS**

Claims 1 to 14, 18 to 22, 26 to 32, 35, 37, 41 and 42 are rejected under 35 USC §102(e) as being anticipated by one or more of Huang et al. '038, Murakami et al. '662, Wieczorek et al. '115 and Joo '861. Claims 33, 34, 36 and 38 are rejected under 35 USC §103 as being unpatentable over Wieczorek et al. '115 in view of Chu '493, Joo '861 in view of Dong et al. '005, and Huang et al. '038 in view of Balasubramanian et al. '853. In addition, claims 15 to 17, 23 to 25, 39 and 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims.

Accordingly, in order to overcome the rejections to the claims, independent claim 1 has now been amended to include all the features of original claims 1, 3, 11, 12, and 15. Claim 15, which the Examiner has indicated would be allowable was originally dependent on claim 12, which in turn was dependent on claim 11, which in turn was dependent on claim 1.

In amending claim 1, all the features of the original claims 1, 3, 11 and 15 have been included in claim 1, together with the features of claim 12, whereby the tapering planes defined by the respective tapered portions define respective relief angles with a central plane bisecting the trench and extending longitudinally along the trench through the open mouth. This feature is further defined by the features of original claim 15, whereby the relief angles defined by the respective tapering planes with the central plane are defined as being different. The feature of claim 12, which includes the limitation that the relief angle should lie in the range of 0.2° to 50°, has been omitted from the amended claim 1, and it is respectfully submitted that even with this limitation omitted from the amended claim 1, the invention as claimed is clearly distinguished over the prior art. It is respectfully submitted that none of the prior art documents of record

describe or suggest a method for forming a filled trench in a semiconductor layer of a semiconductor substrate with the effect of trench voids minimized, which includes all the steps of the amended claim 1.

In particular, none of the prior art references teach or suggest such a method that includes the steps whereby the at least one side of the trench is shaped by forming at least two tapered portions adjacent the open mouth defining respective tapering planes, whereby each tapered portion transitions from an adjacent tapering portion, and one of the tapered portions transitions from the side of the trench at an angle thereto, and whereby the tapering planes defined by the respective tapered portions converge towards the other side of the trench in a direction into the trench and define respective different relief angles with a central plane bisecting the trench and extending longitudinally along the trench through the open mouth. Furthermore, it is respectfully submitted that none of the prior art references teach or suggest a method for forming a filled trench in a semiconductor layer of a semiconductor substrate with the effect of trench voids minimized, which includes the above features. In fact, Applicant notes that the Examiner in his Statement of Reasons for the Indication of Allowable Subject Matter has taken a substantially similar view.

Additionally, in order to more clearly define the invention, some additional revisions have been included over and above the combination of the features of the revised Claim 1, 3, 11, 12 and 15. It is respectfully submitted that there is a fair basis in the specification for all such revisions.

In the amended claim 1, the relieving of the trench adjacent the open mouth is defined as being carried out by shaping at least one side of the trench adjacent the open mouth so that the trench tapers inwardly the adjacent the open mouth. It is respectfully submitted that there is a

fair basis in the specification for the feature of shaping one side of the trench, rather than both. In the specification at page 5, lines 9 and 10, it is stated “advantageously, the trench is relieved adjacent the open mouth thereof on one side of the trench”.

The phrase “so that the trench tapers inwardly adjacent the open mouth” has been adopted in the amended claim 1, since it is respectfully submitted that this is a more accurate way of defining the relieving of the trench, since it is the trench which in effect is tapering adjacent the open mouth rather than the side wall or side walls. The inclination of the side wall which is referred to as a tapered portion is that which causes the trench to taper. Additionally, it is respectfully submitted that it is abundantly clear from the drawing that the trench tapers adjacent the open mouth.

It is respectfully submitted that the phrase “one of the tapered portions transitions from the side wall of the trench at an angle thereto” finds a fair basis in the specification at page 12, lines 31 and 32 where it is stated “the tapered portions 40 transition into the side walls 29 at 41”, and furthermore, it is clear from Fig. 4, and in particular Fig. 5 that one of the tapered portions in each side wall transitions into the side wall at an angle to the side wall. In Fig. 4 the tapered portions 40 transition into the respective side walls 25 at an angle to the side walls 25, and in Fig. 5 the second tapered portions 53 transition into the respective side walls 29 at an angle to the side walls 29.

Additionally, the transitioning of the second tapered portions is referred to in the specification at page 20, lines 24 and 25. It is respectfully submitted that the phrase in the amended claim 1 “each tapered portion transitioning from an adjacent tapered portion” also has a fair basis in the specification and the drawings, since it is abundantly clear from the drawings in particular, and generally from the description that each tapered portion transitions from an

adjacent tapered portion, for example, see Fig. 5, where the second tapered portions 53 transition from the first tapered portions 52.

Accordingly, it is respectfully submitted that the amended claim 1 is fully supported on the specification as filed.

In view of the amendments to claim 1, claims 3, 11 and 15 have been cancelled. Claim 12 has been amended, and now recites the relief angle defined by each tapering plane lies in the range of  $0.2^{\circ}$  to  $50^{\circ}$ , which is the second of the two features that was originally defined in claim 12. Claims 13, 14, 16 and 17 have been amended to conform to the amendments made to claim 1.

Since the subsidiary Claims 2, 4 to 10, 12 to 14 and 16 to 40 are dependent either directly or indirectly on the amended claim 1, it is respectfully submitted that once the Examiner is satisfied of the allowability of the amended claim 1, these subsidiary claims should be allowable, and allowance is respectfully requested.

Claim 41 is directed towards a semiconductor substrate and is dependent on the amended claim 1, accordingly, it is respectfully submitted that once the Examiner is satisfied of the allowability of the amended claim 1, claim 41 should likewise be allowable, and allowance is respectfully requested.

Claim 42, which is directed towards a semiconductor substrate, has been amended to include features that correspond to the features of the method claimed in the amended claim 1. Accordingly, it is respectfully submitted that once the Examiner is satisfied of the allowability of the amended claim 1, the amended claim 42 should likewise be allowable, and allowance is respectfully requested.

New claims 43 to 45 have been added, and it is respectfully submitted that the invention therein defined is novel and not obvious, and thus, these claims should be allowable.

Claim 43 is based on the original claim 23, which the Examiner has indicated would be allowable, if rewritten in independent form to include all the limitations of the base claim and the intervening claims. Claim 23 was originally dependent on claim 22, which in turn was dependent on claim 21, and claim 21 was dependent on claim 1. It is respectfully submitted that new claim 43 includes all the features of the original claims 1, 21, 22 and 23.

New claim 44 is based on the original claim 24, which the Examiner has also indicated would be allowable if rewritten in dependent form to include all the limitations of the base claim and the intervening claims. Claim 24 was originally dependent on claim 21, which in turn was dependent on claim 1. It is respectfully submitted that new Claim 44 includes all the features of the original claims 1, 21 and 24.

New claim 45 is based on claim 25, which the Examiner also indicated as containing allowable subject matter and is dependent on new claim 44.

It is therefore respectfully submitted that new Claims 43 to 45 should be allowable, and allowance is respectfully requested.

The application is now considered to be in condition for allowance, and an early indication of same is requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Matthew E. Connors', written over a horizontal line.

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